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MANAGEMENT | RESEARCH ARTICLE

Economic growth and the demand for foreign labor in the oil-exporting and labor-importing states of the Arab Gulf: Case of Oman

Ibtisam Al Abri^{1,2*}, Omar Al Hinai², Sara Al Raisi², Abdullah Al Harrasi², Zeyana Al Jabri² and Maryam Al Maskari²

Abstract: Despite the generally swift economic growth in the Arab Gulf countries, they still face a national problem with the unemployment of nationals. Given the relatively large inflow of foreign labor across these countries, it is essential to study the association between foreign labor and economic growth in the short and long terms. This paper examines the relationship between economic growth and demand for labor in Oman, considering separately skilled and unskilled labor as well as hydrocarbon GDP and non-hydrocarbon GDP. Additionally, the study conducts formal tests to determine the direction of short-term and long-term Granger causality among all variables, at both aggregated and disaggregated levels. A total of 18 Auto-Regressive Distributed Lag (ARDL) models are applied to examine these relationships. In the long term, results indicate that both skilled and unskilled labor have a positive effect on GDP. However, these relationships are negative in the short term due to adjustment to a new country and productivity reasons. Moreover, it is found that once economic conditions flourish, there is an increased demand for skilled and unskilled expatriate labor. When looking at non-oil activities, a positive relationship between nonhydrocarbon GDP and total expatriate labor is evident. Specifically, the relationships between nonhydrocarbon GDP and unskilled expatriate labor are highly significant indicating a bidirectional relationship. Ultimately, such verdicts provide an insightful guide to policymakers in Oman and the Arab Gulf countries on labor market correlations and dynamics so as to initiate effective labor market reforms and promote jobs for nationals.

Subjects: Macroeconomics; Labour Economics; Development Economics;

Keywords: Foreign labor demand; economic performance; cointegration; granger causality; Auto-Regressive Distributed Lag (ARDL) model; Oman

JEL classification: J08; J23; J24; J61

1. Introduction

The Arab Gulf countries, also known as the Gulf Cooperation Council (GCC) countries,¹ have witnessed significant economic development throughout the past few decades, driven primarily by the oil and gas industry (Al Abri & Al Bulushi, 2022). To sustain this growth, the demand for labor in the region has increased rapidly, leading to an influx of both skilled and unskilled foreign labor. Over the years, the GCC

countries have attracted large numbers of foreign workers which is attributed to several factors. To elaborate, the region's accelerated economic surge, tax-free status, and high salaries have all contributed towards elevated foreign labor levels, and thus, a domestic labor shortage across numerous sectors. Furthermore, some of the jobs, like physically demanding occupations and those that are humbly compensated, have proven to be unfavored by local labor. The development of the economies of GCC countries is labor-dependent, and given the contribution of foreign labor to higher growth and productivity in many sectors, expatriates are considered to be a key factor of economic growth in the developing countries (Emako et al., 2022) especially the GCC (Beidas-Strom et al., 2011). This inference could be validated by the concentration of foreign labor in sectors that are vital to economic growth, like retail, construction, and hospitality. Paradoxically, despite the significantly positive impact of foreign labor on the Arab Gulf economies, several social and economic challenges arose as a result of such dependence, such as social inequality concerns, doubts surrounding long-term economic sustainability, social cohesion issues, and shortage of jobs available to locals (Mansour, 2017). Therefore, the critical connection between the economic performance of the GCC region and its foreign labor demand serves as a major source of concern and complexity.

The presence of expatriate labor in any economy has economic, social, and political implications. The impact of such implications differs based on several factors like the status of the economy, the national employment, and the local social conditions. For the GCC countries, this issue is of special importance due to the relatively high unemployment rate of nationals coinciding with an increasing demand for expatriate labor, which is a crucial socio-economic challenge that is not socially accepted (Hertog, 2012). Despite rapid economic growth and diversification (Al Abri et al., 2023), the GCC has been struggling with significant national underemployment for many years. The GCC countries share common national development goals including diversification of the economy and job creation for locals. Unemployment has become a serious concern in the GCC countries in recent years and thus, employment creation has become a clear priority (Beidas-Strom et al., 2011). Although, this entails the necessity of ensuring that economic growth is accompanied by employment creation for nationals, i.e. fulfilling national development objectives by supporting economic development without reorienting the growth model is not enough. Therefore, to attain such goals, the focus should be emphasized on productivity improvement, encouraging private sector growth, and making sure labor market policies are in support of national employment. It is also noted that the hiring of nationals is healthier for the overall economic stability of the country since citizens spend all, or most, of their salaries within the economy, contributing to the overall economic growth (Shayah & Sun, 2019).

One of the reasons behind concerns regarding the presence of foreign labor in the GCC is considering the percentage they represent in the total population. Table 1 shows that 88.5% of United Arab Emirates is comprised of expatriates, which is the highest out of all GCC countries. On the opposite end, Saudi Arabia's population consists of only 32.7% expatriates. Oman has the second least percentage among its neighboring countries at 44%, but it still represents a high representation. A possible justification for why

Table 1. Percentage of expatriates in GCC countries

Country	Expatriate as a percentage of the total population
United Arab Emirates	88.50%
Qatar	85.70%
Kuwait	69.20%
Bahrain	52.00%
Oman	44.00%
Saudi Arabia	32.70%

Source: <https://www.go-gulf.ae/expatriate-middle-east/>.

Saudi Arabia and Oman have the least percentage of expatriates is the nationalization (Saudization and Omanization) programs. These two countries were early in their attempt at reducing the number of expatriates in the working force to offer more job opportunities for their national citizens. On the upside, the oil-exporting GCC countries have been experiencing labor-intensive economic growth, which has been backed by a significant influx of foreign labor (Beidas-Strom et al., 2011). It is observed that the discovery of oil positively influenced developing regions, leading to an increase in the total population including expatriates that generated demand for infrastructure and contributed to overall development (Michaels, 2011). Foreign labor also adds valuable skills, ideas, and networks in both economic expansion and contraction like in Europe and the United States (D'Amuri et al., 2008). Correspondingly, growth in remittance outflows affects growth in real GDP as in the case of Saudi Arabia (Al Kaabi, 2016). These findings suggest that the inflow of foreign workers in the Arab Gulf countries could have a similarly positive impact on their economies. Given the percentages across GCC countries, it is critical to study the effects and consequences of expatriate labor presence on the economy in the short and long term.

Oman is heavily reliant on expatriates for economic development (Al Abri et al., 2023). Foreign labor has grown from lower than 0.5 million workers in 2003 to around 2 million in 2019 (NCISI, 2020), according to the National Center for Statistics and Information (NCISI). This growing dependence on foreign labor, which characterizes the GCC region, is linked to domestic labor shortage, swift economic development, and local aversion to specific job categories. Foreign labor's influence on economic performance has long piqued the interest of researchers. Ali et al. (2017) conducted a qualitative study that proved the dependence of economic growth on expatriates, one reason being the concentration of foreign labor to be mainly in sectors like construction, hospitality, and manufacturing, all of which are deemed imperative to economic growth. Although, this could also be rationalized by the fact that employers tend to favor expats, and often offer lower wages to locals relative to them. Also, locals are observed to lack the critical skills required by employers. Furthermore, the risks of losing national identity and culture in the long term have become more prevalent alongside the growing demand and need for foreign labor.

Due to the job insecurity for locals imposed by the increasing demand for foreign labor in the GCC, Oman and Bahrain are heavily pressurized, compared to their neighbors, in regard to nationalizing their private sector labor markets. This is partly due to the similarity of their labor market structures and available resources for citizens, compared to Saudi Arabia. However, these countries have implemented nationalization policies to a greater degree, with a particular focus on "de-segmentation". Although some degree of nationalization has occurred in the low-wage sectors, the overall rates of nationalization are higher across all sectors in comparison to Saudi Arabia.

Given the possible impact of this relationship, there has been an increasing number of studies on the relationship between foreign labor and economic growth (Burnside & Dollar, 2000; Christopher, 2000; Easterly, 2003; Hansen & Tarp, 2000; Krichel & Levine, 2002; Manfred, 2003; Mortensen Dale, 2004). In the Arab Gulf, however, the relationship and the causality directions between economic growth and total expatriate labor have not been directly examined. The first objective of this study is to examine the relationship between economic growth and demand for labor, at aggregated and disaggregated levels of both variables, for the case of Oman. It also administers formal tests in a bid to identify the directions of both short and long-run Granger causality among all variables at aggregated and disaggregated levels. The linkage between the two variables could be a unidirectional or bidirectional association. Although this relationship is of special importance to the oil-exporting and labor-importing states of the Arab Gulf, it is seriously under-researched in these countries with few studies that mostly provided qualitative analysis. Therefore, the study contributes to two recent policy debates in Oman, and the GCC countries, that involve concerns about the consequences of an increased foreign labor force. The first concern is about the role expat workers play in the economic growth of the country. The second concern is regarding the increasing rate of unemployment among nationals. Considering the paybacks and drawbacks of foreign labor presence in the region, understanding the relationship between the demand for foreign labor and the economic performance in the Arab Gulf region is crucial for policymakers and researchers.

The rest of the paper is structured as follows. The next section reviewed the relevant literature. The third section provides the theoretical framework and the fourth section presents the methods and methodology used in the study. The fifth and sixth sections describe the data and the results, respectively. Finally, the last section concludes.

2. Literature review

Although there is a large literature on the relationship between labor and different macroeconomic indicators, previous studies have not directly examined the association between the demand for expatriates and the overall economic performance in the GCC countries which are considered as developing high-income nations characterized by distinct economic structures. The question of whether economic expansion derives the demand for foreign workers or vice versa has been left unanswered. There is a possibility of a bidirectional relationship as well.

Considering the linkage between economic growth and employment, Salter (1960) found a positive relationship between growth rate and employment. Further, a study by Roberts and Skoufias (1997) discovered a relationship between employment and the elasticity of output and wage. Ross and Zimmerman's (1993) findings indicated that labor demand fluctuations were mainly a result of exogenous changes in demand, with secondary effects realized from technological advances and labor. The demand for labor is affected by labor costs, with wage costs influencing entrepreneurial investment decisions in mainstream economic theory. Several studies have used wages as an explanatory variable for determining labor volume, such as Flaig and Steiner (1989), Hazledine (1981), and Disney and Kiang (1990). The wage rate effects on employment levels depend on their nature and the wage-bargaining system structure. Calmfors et al. (1988) and Freeman (1988) have shown that both centralized and decentralized wage-bargaining systems can produce favorable employment outcomes. Appelbaum and Schettkat (1995) argued that institutional differences in wage bargaining could explain the different sectoral patterns in employment trends during periods of excess labor supply.

Other studies have focused on the association between economic growth and labor demand for oil-exporting countries. Hamilton (2016) took West Texas as a case study and looked at how changes in oil prices affect the economy and, more specifically, the labor market. Using grounded theory, the author analyzed employment relative to oil price fluctuations. It was seen that during a downturn, many workers in West Texas were laid off. For Russia, Baranov et al. (2018) established a direct link between oil prices and economic activities. The results are relevant to the GCC since oil exporting is a major portion of Russia's government revenue and about 30% of their population is employed in the public sector. The findings, directly and indirectly, proved two conclusions. The first is that there is a relationship between economic growth and oil prices. The second is that there is a relationship between economic growth and population migration. For the GCC countries, there are comparative assessments of the labor market. One of which is by Hertog (2012) which compares the different rates of nationals versus expatriates in different sectors. He noticed that in Oman, for example, some sectors have high levels of Omanis; however, a great portion of these Omanis have a tertiary level of education compared to the active portion of expatriates active in the same sector. He also reported a similar situation in Bahrain where nationals are placed in unskilled jobs with low salaries due to the high unemployment rate. Kuwait, Qatar, and UAE behave differently. These three GCC countries have relatively higher incomes and are heavily dominated by their expatriate population.

Similar to this study, few studies have considered GDP as a proxy for economic performance in investigating the linkage between economy and labor demand. For example, Bryant et al. (2004) studied the impact of a growth in employment on GDP, while mostly focusing on how adding young women into the labor force affects New Zealand's GDP. Nevertheless, they found that raising employment leads to an increase in GDP. In one scenario, raising overall participation by around 140,000 was found to generate an extra \$6 million of GDP which is about 5% more than the base case scenario.

Several studies have discussed labor migration to the Arab Gulf where foreign labor levels have been rising since 1980 (see, amongst others: Abu-Lughod, 1983; Beranek, 1982; Birks & Sinclair, 1980; Fergany, 1983; Owen & Schnare, 1985; Serageldin et al., 1983b; Serageldin et al., 1983a). Moreover, Birks et al. (1986) investigated the impact of the downturn in economic activity on the stocks and flows of expatriate workers in the Arab Gulf states, but by applying qualitative analysis. These studies verified an intimate relationship between the expatriate's influx into the Gulf oil revenues acceleration and the increasing investment in the domestic industry and infrastructure. However, economic expansion inevitably created a demand for expatriates far beyond the capacity of the local labor market (Birks et al., 1986). In the case of Oman, between the years 1975 and 1980, government expenditure increased by 70 percent, whilst labor cards issuance to expats grew by 83 percent from 81,250 to 148,800. In addition, a limited number of studies (see, Birks et al., 1988; Fargues, 2011; Khalaf & Alkobaisi, 1999; Shah, 2004a, 2004b) have investigated labor immigration patterns in the Arab Gulf and have emphasized the temporal changes in the size and characteristics of employment segments. For instance, Kapiszewski (2004) compared the Arab and Asian laborers in the GCC states, examining the socioeconomic and cultural factors that have an impact on their influx and residence in the region. The study found that, since the year 2000, Arab immigrant levels have declined, with only 3.2 million non-Gulf Arabs compared to 9 million non-Arab immigrants in the GCC states in 2004.

In the case of Oman, the nexus between demographic, labor market, and migration issues was investigated by De Bel-Air (2015). Immigrant labor levels in Oman have been rising since the year 2000 and continue to do so, as reported by the author. Most of the immigrants flowing into Oman are Asian, particularly from India, Bangladesh, and Pakistan, accounting for 87% of the total workforce in 2013, with 5% of them as public sector employees. Another study by Das and Gokhale (2009) focused on the impact of Omanization policy and localization on immigrant flows, specifically considering South Asian countries. The study found that the significant contribution of foreign laborers to the Omani economy does not only include low-skilled jobs in the private sector, but is also comprised of high-skilled jobs in sectors such as oil and gas, health, education, insurance, and hotels. Mansour (2017) investigated the residential clustering of the main immigrant groups in Oman, namely Indians, Bangladeshis, Pakistanis, and Sri Lankans, based on their work skills, distinguishing between higher and lower skill levels. The author emphasized the importance of comprehending the spatial distribution of low and high-skilled immigrants in Oman, as it has significant geographical, economic, social, and demographic consequences. Moreover, quantitative studies that applied Okun's Law have shown that, over time, a 1% increase in the GDP is anticipated to produce a nearly 0.5% increase in employment when applied to the GCC growth rates (Beidas-Strom et al., 2011). In Oman specifically, Beidas-Strom et al. (2011) have stated that a 1% increase in nonhydrocarbon GDP resulted in a rise in employment of nationals equivalent to 1.53%, with the increase in total employment being 0.75%.

Extensive literature looked at the determinants of labor demand. They provide both theoretical and empirical examination and clarification of labor demand for different countries around the world (Disney & Kiang, 1990; Flaig & Steiner, 1989; Nickell, 1987). Across different countries, the determinants vary dependently. Alkhateeb et al. (2017) studied the effect of oil prices on employment in Saudi Arabia and noticed a positive influence of oil prices on employment. For a thorough investigation of this relationship, determinant factors of economic growth should be accounted for in the analysis. For example, GCC countries are mostly dependent on oil as their key source of revenue, meaning hydrocarbon GDP should be an important factor to consider. Given the nature of the recycling economies in the GCC, where revenue and expenditure are moving parallelly and are the main factors in fueling economic growth, revenue and expenditures are vital macroeconomic indicators that could influence the association between the number of expatriates and the overall economic growth. While investigating the relationship between government revenue and the number of expatriates, the relationship could be linked indirectly through hydrocarbon activity. Previous studies were also concerned about the relationship between government expenditure and the number of migrant workers which was found to be strong and positive. For instance, the estimated correlation coefficient between government expenditure and migrant worker stock in Oman is found to be 0.96 (Birks et al., 1986). Moreover, for the GCC countries,

short-term capital spending tends to generate demand for expatriates, while current spending more likely impacts the employment of nationals (Beidas-Strom et al., 2011). However, the determinants of labor demand differ depending on the model and the country (Aljebrin, 2012). Hazledine (1981), Salter (1960), Oster (1980), and Ibrahim (2012) have identified the growth rate as one of the determinants of labor demand. In recent years, dynamic analysis of labor demand has highlighted the dependence of employment on firms' output expectations, factor prices, the level of fixed factors, technical progress, and broader business conditions (Darby & Wren-Lewis, 1991; Nickell, 1987; Pehkonen, 1992). However, the role of foreign labor in the flourishing of the economy and the growth in the number of expatriates during periods of economic growth are yet to be investigated topics.

3. Theoretical framework

Labor resources including availability and quality are key drivers of economic growth in any country as they heavily impact the process and costs of production (Auzina-Emsina, 2014). Labor demand theory is an economic concept that seeks to explain the relationship between the demand for labor by employers and various factors influencing that demand. It is a fundamental component of labor economics and helps economists and policymakers understand how firms make decisions regarding their hiring practices and workforce size. Labor demand theory can be generalized and applied at the country level to understand the factors influencing the demand for labor within a specific economy. Various country-level factors can shape labor demand and have implications for employment patterns, economic growth, and policy decisions.

Economic Growth is a key aspect of labor demand theory at the country level (Fields, 2011; Taira, 1970). Countries with high economic growth rates may experience increased labor demand as businesses expand their operations to meet rising demand for goods and services. For example, Alkahteb et al. (2017) reported that economic growth is one of the main determinants of labor and employment growth in Saudi Arabia.

The simple theoretical framework of this research delves into the intricate relationship between the labor market, economic growth, and the role of foreign labor. As globalization and international mobility have become defining features of contemporary labor markets, the integration of foreign labor becomes a significant factor influencing economic outcomes. The concept of comparative advantage, rooted in trade theory, extends to the labor market, where countries may benefit from employing foreign workers with specialized skills or in industries where their home country possesses a competitive edge. The inflow of foreign labor can boost production efficiency, foster innovation, and enhance overall productivity, thereby contributing to economic growth.

Oman has a small open economy that heavily relies on oil resources (Al Abri et al., 2023). Given the nature of the recycling economy, oil revenues directly fuel public investment and indirectly influence private sector investments as well (Ahmad & Masan, 2015; Al-Abri et al., 2019). Although economic expansion in Oman is conditional on elevated revenue and investments, the availability of labor, especially foreign labor due to the local workforce shortage or preferences, is an important factor. However, with the growing debates on this matter, and due to the lack of research on this topic, it is necessary to generally determine the linkage between foreign labor and economic growth in such a country, before conducting in-depth studies to enrich the overall understanding and uncover the mechanisms and dynamics that underpin this critical nexus.

4. Methods and methodology

To investigate the relationship between economic growth and expatriate labor in Oman, and consistent with the literature (Alam & Ahmed, 2010; Arize & Malindretos, 2012; Emran & Shilpi, 2010; Yin & Hamori, 2011; Zhou & Dube, 2011), Auto-Regressive Distributed Lag (ARDL) Models are applied with multiple requisite testing for long term cointegration between the regressors. Furthermore, a bounds test was also conducted to determine the existence of cointegration whereby an ARDL/Error-Correction (EC) Model was then applied to assess the short and long-run relationships between variables when cointegration was proven. The stochastic properties

identified through the stationarity tests support the suitability of implementing the ARDL model or ARDL/EC model for the data.

For economic growth, GDP is used as a proxy. In this paper, GDP is segregated into three indicators: total GDP, hydrocarbon GDP, and nonhydrocarbon GDP. The number of foreign labor is segregated into three indicators, as well: total expatriate labor, skilled expatriate labor, and unskilled expatriate labor. A total of 18 models mainly were developed where total real GDP was interchanged for real hydrocarbon and nonhydrocarbon GDP while the total number of expatriate labor was also interchanged for the volume of skilled and unskilled expatriate labor. A critical value of 5% was considered for all models. To examine the relationship between economic growth and labor demand, we specify three sets of main equations. For example, the first set of equations is specified to address the relationships between disaggregated levels of GDP and total expatriate labor as follows:

$$GDP_t = \beta_0 + \beta_1 EXPAT_t + \beta_2 GEXP_t + \beta_3 GREV_t + \varepsilon_{1t} \quad (1)$$

$$HGDP_t = \beta_0 + \beta_1 EXPAT_t + \beta_2 GEXP_t + \beta_3 GREV_t + \varepsilon_{2t} \quad (2)$$

$$NHGDP_t = \beta_0 + \beta_1 EXPAT_t + \beta_2 GEXP_t + \beta_3 GREV_t + \varepsilon_{3t} \quad (3)$$

where GDP_t , $HGDP_t$, and $NHGDP_t$ are total real GDP at constant prices of the base year 2010, real hydrocarbon GDP, and real non-hydrocarbon GDP at year t . $EXPAT_t$ is the total number of expatriate labor in Oman which is later disaggregated into skilled labor $SEXPAT_t$ and unskilled labor $USEXPAT_t$ in the other sets of equations. Further, $GEXP_t$ and $GREV_t$ are government expenditures and government revenue, respectively. Based on relevant literature, government expenditure and revenue play a vital role in this context given that it is the main source for public and private sector projects and investment (Al-Abri et al., 2019) indicating the recycling nature of the economy, thus employment of foreign labor. Further, government revenue indicates natural capital (natural resources) as it is dominated by oil revenues. In this study area, previous studies include variables related to physical capital like investment or gross fixed capital formation; however, for the case of a heavily oil-dependent country, Al-Abri et al. (2019) have found a causality relationship from government spending and revenues toward the private investments in Oman. The studied variables mentioned are presented in logarithmic form and denominated in millions of Omani rials. For the purpose of this study, a time-series dataset spanning 17 years (2003–2019) at an annual frequency has been constructed using data from the National Center for Statistics and Information (NCSI), the Ministry of Labor, and the Central Bank of Oman (CBO).

Initially, the integration properties of the time series variables were tested using the ADF unit root test, since most of the macroeconomic variables were found to be non-stationary and integrated of order one (I(1)). The ARDL approach is a commonly used method for estimating models with non-stationary data, as it can handle variables that are I(1) or a combination of I(0) and I(1) processes. Therefore, to investigate the short- and long-run relationships between the variables, the ARDL approach has been employed.

We first specify the following three sets of main equations. The first set of equations considers the relationships between the total number of expatriates and the total GDP, hydrocarbon GDP, and non-hydrocarbon GDP. The second and third sets of equations represent the same relationships as in the first set but instead consider heterogeneous labor skills: skilled and unskilled foreign labor, respectively.

$$LGDP_t = \beta_0 + \beta_1 LEXPAT_t + \beta_2 LGEXP_t + \beta_3 GREV_t + \varepsilon_{1t} \quad (1a)$$

$$LHGDP_t = \beta_0 + \beta_1 LEXPAT_t + \beta_2 LGEXP_t + \beta_3 GREV_t + \varepsilon_{2t} \quad (2a)$$

$$LNHGDP_t = \beta_0 + \beta_1 LEXPAT_t + \beta_2 LGEXP_t + \beta_3 GREV_t + \varepsilon_{3t} \quad (3a)$$

$$LGDP_t = \beta_0 + \beta_1 LSEXPAT_t + \beta_2 LGEXP_t + \beta_3 GREV_t + \varepsilon_{1t} \quad (1b)$$

$$LHGD\text{P}_t = \beta_0 + \beta_1 L\text{SEXPAT}_t + \beta_2 LG\text{EXP}_t + \beta_3 GREV_t + \varepsilon_{2t} \quad (2b)$$

$$LNHGDP_t = \beta_0 + \beta_1 L\text{SEXPAT}_t + \beta_2 LG\text{EXP}_t + \beta_3 GREV_t + \varepsilon_{3t} \quad (3b)$$

$$LGDP_t = \beta_0 + \beta_1 L\text{USEXPAT}_t + \beta_2 LG\text{EXP}_t + \beta_3 GREV_t + \varepsilon_{1t} \quad (1c)$$

$$LHGD\text{P}_t = \beta_0 + \beta_1 L\text{USEXPAT}_t + \beta_2 LG\text{EXP}_t + \beta_3 GREV_t + \varepsilon_{2t} \quad (2c)$$

$$LNHGDP_t = \beta_0 + \beta_1 L\text{USEXPAT}_t + \beta_2 LG\text{EXP}_t + \beta_3 GREV_t + \varepsilon_{3t} \quad (3c)$$

where all mentioned variables are in the log form and $LGDP_t$, $LGEXP_t$, and $IGREV_t$ are in millions of Omani Rials. To estimate the equations, first, we test the integration properties of time series variables using the ADF unit-root test, this will determine the appropriate approach to modeling the variables in scope. Based on the results of the ADF unit-root test, the ARDL approach is considered to examine the short-run and long-run relationship between variables. A general form of the ARDL model of Equations (1), as an example, is represented as follows:

$$\begin{aligned} \Delta LGDP_t = & C_1 + \sum_{i_1=1}^{l_1} \tau_{1i_1} \Delta LGDP_{t-i_1} + \sum_{i_2=1}^{l_2} \alpha_{1i_2} \Delta L\text{EXPAT}_{t-i_2} + \sum_{i_3=1}^{l_3} \alpha_{2i_3} \Delta LG\text{EXP}_{t-i_3} + \sum_{i_4=1}^{l_4} \alpha_{3i_4} \Delta LGREV_{t-i_4} + \\ & \beta_1 L\text{EXPAT}_{t-j} + \beta_2 LG\text{EXP}_{t-j} + \beta_3 LGREV_{t-j} + \varepsilon_t \end{aligned} \quad (4)$$

$$\begin{aligned} \Delta LHGD\text{P}_t = & C_2 + \sum_{i_1=1}^{l_1} \tau_{2i_1} \Delta LHGD\text{P}_{t-i_1} + \sum_{i_2=1}^{l_2} \delta_{1i_2} \Delta L\text{EXPAT}_{t-i_2} + \sum_{i_3=1}^{l_3} \delta_{2i_3} \Delta LG\text{EXP}_{t-i_3} + \sum_{i_4=1}^{l_4} \alpha_{3i_4} \Delta LGREV_{t-i_4} \\ & + \lambda_2 LNHGDP_{t-j} + \theta_1 L\text{EXPAT}_{t-j} + \theta_2 LG\text{EXP}_{t-j} + \beta_3 LGREV_{t-j} + \varepsilon_t \end{aligned} \quad (5)$$

$$\begin{aligned} \Delta LNHGDP_t = & C_3 + \sum_{i_1=1}^{l_1} \tau_{3i_1} \Delta LNHGDP_{t-i_1} + \sum_{i_2=1}^{l_2} \vartheta_{1i_2} \Delta L\text{EXPAT}_{t-i_2} + \sum_{i_3=1}^{l_3} \vartheta_{2i_3} \Delta LG\text{EXP}_{t-i_3} + \sum_{i_4=1}^{l_4} \alpha_{3i_4} \Delta LGREV_{t-i_4} \\ & + \lambda_3 LNHGDP_{t-j} + \mu_1 L\text{EXPAT}_{t-j} + \mu_2 LG\text{EXP}_{t-j} + \beta_3 LGREV_{t-j} + \varepsilon_t \end{aligned} \quad (6)$$

where in Equation (4), Δ shows the first difference, " l_i ", signifies the maximum lag of a variable. AIC information criteria were employed to find the optimal lags of variables. The term λ_1 stands for the error-correcting speed of adjustment. The parameters β_i and α_i represent the long-run and short-run impact of independent variables, respectively. Consistent with Pesaran et al. (2001), the study used a modified F-test statistic to examine the null hypothesis of no cointegration among variables in the regression models.

5. Data description

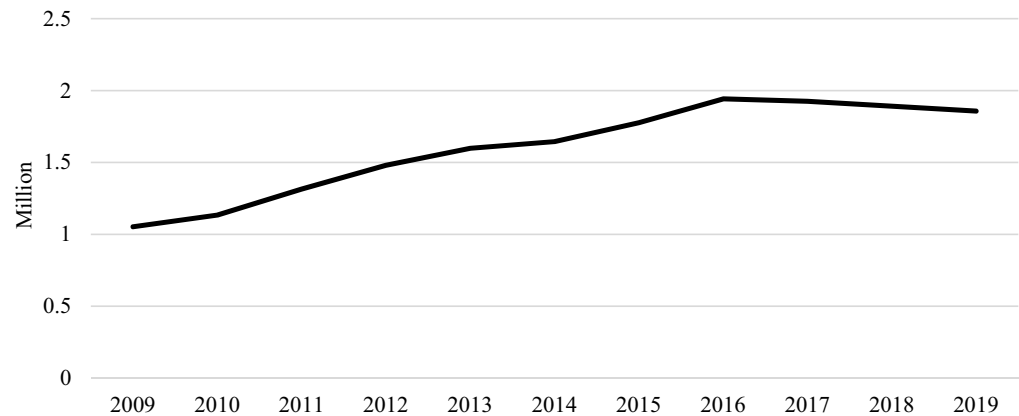
In Table 2, we present a description of the time series variables. The results from conducting the Skewness, Kurtosis, and Jarque-Bera normality tests reveal that the hypothesis of a normal distribution of the time series variables cannot be rejected at a significant level of 5%.

Considering Figure 1, there appears to be a general increase in the number of expatriates over the years up until 2016. The growth appears to be sharper in 2011 which coincided with the Arab Spring of that year, in which Oman has considerably increased wages and provided employment to a significant number of Omani job seekers in numerous government sectors, which have resulted in a significant workforce shift towards government jobs. Consequently, the private sector was forced to recruit new workers (Al-Abri et al., 2019). After 2016, there has been an apparent decrease in foreign labor due to a drop in oil prices, which forced companies to reduce the number of workers. By 2018, the number was still declining due to low oil prices and the new restrictive visa rules in support of Omanization.

Table 2. Statistical description of data

	GDP	HGDP	NHGDP	EXPAT	SEXPAT	USEXPAT	GEXP	GREV
Mean	4.35	4.02	4.11	6.02	5.05	5.97	4.70	4.70
Standard deviation	0.09	0.05	0.15	0.24	0.17	0.24	0.19	0.24
Maximum	4.46	4.08	4.29	6.25	5.19	6.22	4.97	4.95
Minimum	4.21	3.93	3.84	5.61	4.65	5.56	4.32	4.25
Skewness	-0.24	-0.22	-0.46	-0.66	-1.29	0-.60	-0.56	-0.39
Kurtosis	1.61	1.58	1.92	1.94	3.15	1.86	1.81	2.48
Jarque-Bera normality test	4.68	4.99	2.58	3.49	5.11	3.66	3.77	0.72
Probability	0.09	0.08	0.27	0.17	0.07	0.16	0.15	0.69

Figure 1. Total number of expatriates in Oman 2009–2019.



By looking at segregated expatriates by the level of skills, we can see that there are more apparent variations in the number of expatriates, as shown in Figure 2. It is clear that the number of limited-skilled workers is the majority in Oman. It sharply increased up until 2016 and then approximately leveled off. The skilled and occupational laborers similarly behaved but less sharply. However, the numbers steadily dropped after 2016. On the other hand, the number of specialist and technical workers generally remained the same over the years.

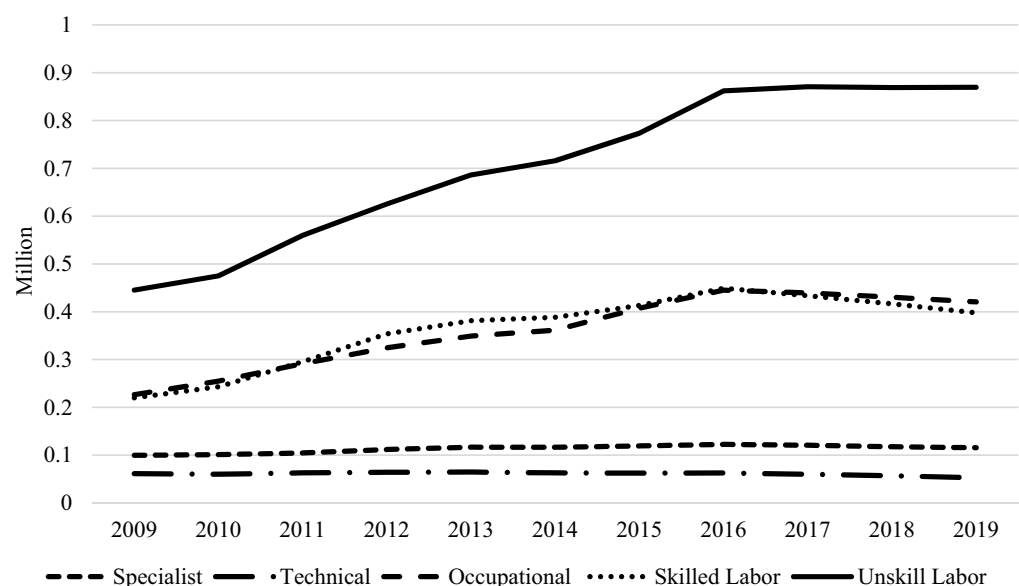
6. Results and discussion

As a preliminary step, we conducted an ADF unit root test to examine the stochastic properties of the variables. We tested the integration degree of the variables with a constant and for both the level and first difference of the variables. The results of the integration order of the variables are presented in Table 3. The findings indicate that all variables, except for those related to GDP, are $I(0)$, while GDP variables are stationary in their first difference format $I(1)$. The variables in the specified equations are combinations of $I(1)$ and $I(0)$ variables. Based on these results, we conclude that the ARDL model is the most suitable approach for estimating the short-run dynamics and long-run relationships among the variables.

6.1. Cointegration analysis

To facilitate the comparison among several estimated equations, this discussion in this section is purposely divided into two parts according to different dependent and independent variables so

Figure 2. The number of expatriates by skill level in Oman 2009–2019.



that each part presents a specific summary of results for easy referring and comparison. The first part, as in Table 4, focuses on the cointegration between economic growth and foreign labor in which the dependent variables are the aggregated and disaggregated GDP. This yields nine models (Equations 1a–3c) along with 18 estimated coefficients representing short and long terms. The second part, as in Table 5, discusses the cointegration between the number of expatriates and the economic performance where the dependent variables are the aggregated and disaggregated foreign labor. There are also nine models to depict these associations. These two parts reveal important information about the relationships between labor demand and economic performance in Oman at aggregated and disaggregated levels.

Particularly, Table 4 shows that both aggregated and disaggregated expatriates are cointegrated with total GDP in the short and long terms. However, only USEXPAT is cointegrated with both aggregated and disaggregated GDP mainly in the long run. On the other hand, as shown in Table 5, NHGDP (and HGDP at a 10% level of significance) is cointegrated with total and USEXPAT in the long term. Therefore, there exists a bidirectional cointegration between nonhydrocarbon GDP and unskilled expatriate labor in the long run. However, this bidirectional relationship does not exist in the case of hydrocarbon GDP.

Specifically, the estimation of the partial effects indicates that a 10% increase in the number of expatriates correlates with a 1.21% increase in real GDP and a 2.07% increase in real nonhydrocarbon GDP holding other variables constant. At disaggregated levels, a 10% increase in the

Table 3. The results of the ADF unit root test

Variables	Level		First difference	
	Test statistics	p-value	Test statistics	p-value
GDP	−1.356	0.098	−2.472	0.014
HGDP	−0.230	0.411	−3.025	0.005
NHGDP	−1.193	0.127	−3.986	0.001
EXPAT	−1.913	0.038	−5.608	0.000
SEXPAT	−2.668	0.009	−3.916	0.001
USEXPAT	−1.882	0.040	−5.701	0.000
GEXP	−2.701	0.009	−2.635	0.010
GREV	−2.161	0.024	−2.757	0.008

Notes: SIC criterion was used to select the optimal values of lags.

Table 4. Cointegration estimates when GDP-related variables are considered

Dependent Variables		GDP	HGDP	NHGDP
Horizon	Independent Variables	Coef. & Significance		
SR	EXPAT	−0.041**	−0.068**	−0.038
	SEXPAT	−0.059**	−0.094	0.003
	USEXPAT	−0.143**	−0.063	−0.035
LR	EXPAT	0.122**	0.059	0.207**
	SEXPAT	0.164**	0.061	0.126
	USEXPAT	0.114**	0.052**	0.194**

Table 5. Cointegration estimates when expatriate-related variables are considered

Dependent Variables		EXPAT	SEXPAT	USEXPAT
Horizon	Independent Variables	Coef. & Significance		
SR	GDP	1.676	−0.047	1.943
	HGDP	−5.238	−2.979*	−5.491
	NHGDP	−4.109	0.449	−4.970
LR	GDP	1.510	NC	1.680
	HGDP	−4.855*	−4.838	−4.978*
	NHGDP	2.766***	NC	2.813***

NC: No cointegration is found.

number of skilled expatriate labor correlates with a 1.64% increase in real GDP; while, a 10% increase in the volume of unskilled expatriate labor correlates with a 1.14% and a 1.94% rise in real GDP and real nonhydrocarbon GDP holding other variables constant, respectively. Furthermore, findings reveal that a 10% increase in real nonhydrocarbon GDP is correlated with a 27.7% growth in the total volume of expatriate labor, and specifically a 28.1% growth in the volume of unskilled expatriate labor holding other variables constant.

When looking at models 1–9 in Table A1 in the Appendix, GDP and its two subdivisions are the dependent variables. Expatriate labor has varying effects on GDP in the short and long terms. Skilled labor, unskilled labor, and total volume of labor appear to have the same effect on GDP, hydrocarbon GDP, and nonhydrocarbon GDP. In the long term, all kinds of labor seem to have a positive effect on GDP. This same result has been observed in other countries like in Bryant et al. (2004) who showed the case of New Zealand. When investments are made in the country, there will be a higher demand for foreign labor especially in the GCC countries as their citizens do not favor physically demanding or low-paying jobs. Regardless of the source of capital, when projects are initiated or businesses are created, all forms of labor are needed for the projects to commence. When these projects and businesses are established, there will be a positive effect on the economy in the long run. Thus, GDP is then expected to improve by the increase of skilled and unskilled labor. On the other hand, in the short term, all independent variables produce a negative effect on GDP. A possible interpretation of this phenomenon is that business owners predict and report the demand for labor before it happens. This means that in the short term, before any benefit is reaped from the labor, there is a retraction in GDP because of the expenses required when bringing labor to Oman. That effect is seen regardless of whether the labor is skilled, or unskilled, or when considering the total volume. Another explanation for a negative short-term GDP is that sufficient time is needed for people to adjust to new countries. This would mean that when expatriates arrive, there could be an increased demand for imports. While import demand is increasing, the productivity of the labor that was introduced to Oman's economy is still at its early stage. Therefore, if imports are rising and foreign labor productivity is not being seen yet, there would be a negative effect on total GDP in the short term. When looking at the hydrocarbon sector, the volume of labor appears to have no significant impact on this sector which could be attributed to the nature of this sector as a capital-intensive sector.

Looking at models 10–18 in Table B1 in the Appendix, it is shown that the main relationship found across different variables is the effect of hydrocarbon GDP on expatriate labor in the long term. A positive long-term effect is found between hydrocarbon GDP and different skill levels of expatriate labor. Oman's economic growth is heavily dependent on oil prices and hydrocarbon activity. Therefore, growth in the hydrocarbon sector through higher oil prices will lead to an overall improvement in all economic sectors including the nonhydrocarbon sector (Al-Abri et al., 2019) which will consequently increase the demand for skilled and unskilled expatriate labor in the country. This finding is consistent

with historical occurrences of economic booms and slow-downs as previously shown in Figures 1 and 2. It is also apparent in other countries as well, for example, the study by Hamilton (2016) reported that a decline in oil prices led to a decline in total employment in West Texas. In the case of Russia, Burakov (2017) showed similar results as an oil-exporting country. The study disclosed that rising oil prices lead to improved economic activity which results in a demand for labor which further lead to more employment. Furthermore, during economic growth, the government expands projects and private sector investment surges. This could make the country more appealing to expatriates who are looking to move to Oman. When looking at nonhydrocarbon GDP, there is a positive relationship between this sector and total expatriate labor. To be more specific, the relationship between nonhydrocarbon GDP and unskilled expatriate labor is highly significant. Unskilled foreign labor is usually used for blue-collar jobs especially during economic growth as locals avoid jobs that require physical exertion and offer low wages.

Three diagnostics tests are considered for the main 18 models: Breusch—Godfrey serial correlation Lagrange-Multiplier (LM) Test, White's Heteroskedasticity Test, and Jacque—Bera normality test. All estimated models do not suffer from serial correlation, heteroskedasticity, or non-normality.²

6.2. Granger causality tests

The second objective of this study is to identify the directions of both short-run and long-run Granger causality among all variables at aggregated and disaggregated levels. When first considering the total number of expatriate labor as detailed in three panels of Table 6, three series of Granger causality tests are conducted depending on the disaggregated forms of GDP: total real GDP (Panel A), real hydrocarbon GDP (Panel B), and real nonhydrocarbon GDP (Panel C). When total real GDP is considered (Panel A), the short-run Granger causality tests yield insignificant results. However, the long-run causality t-stats indicate significance in the error correction term when total real GDP is the dependent variable at a 1% level of significance. Similarly, the error correction term for the total volume of expatriate labor is also significant, but at a 10% level of significance. Taking into account the joint short and long-run causality tests, it is found that the volume of expatriate labor Granger causes total real GDP. Considering real hydrocarbon GDP (Panel B), short-run test results indicate no significance among variables. On the other hand, long-run causality t-stats indicate significance in the error correction term for real hydrocarbon GDP at a 5% level of significance. Moreover, the findings reveal that the volume of expatriate labor Granger causes real hydrocarbon GDP in the joint term. By examining Panel C for the real non-hydrocarbon GDP, short-run test results display that the total volume of expatriate labor Granger causes real non-hydrocarbon GDP at a 10% level of significance. It is also observed from the short-run causality tests that real non-hydrocarbon GDP causes the total volume of expatriates at a 1% level of significance. On the other hand, there is a long-run causality for total volume of expatriates at the 1% level of significance. Taking into account the joint term, it is obvious that real non-hydrocarbon GDP Granger causes the volume of expatriate labor.

Analogously, Table 7 illustrates the results for skilled expatriate labor. Although the short-run Granger causality results are insignificant when total GDP is considered (Panel A), the long-run causality is significant at the 1% level of significance. In the joint term, it is found that the volume of skilled expatriate labor Granger causes total real GDP. In the case of hydrocarbon GDP (Panel B), no significant causalities are reported. However, Panel C shows some significant results for the non-hydrocarbon GDP. Short-run test results indicate that the volume of skilled expatriate labor Granger causes non-hydrocarbon GDP at a 1% level of significance. On the other hand, long-run causality t-stats indicated significance in the error correction term for real non-hydrocarbon GDP at the 1% level of significance and the volume of skilled expatriates at the 5% level of significance. Considering the joint term, the volume of skilled expatriate labor Granger is found to Granger cause real non-hydrocarbon GDP whilst real non-hydrocarbon GDP Granger causes the volume of skilled expatriate labor. In other words, a bidirectional Granger causality is observed between the volume of skilled expatriates and real non-hydrocarbon GDP.

Similarly, Table 8 presents results when the volume of unskilled expatriate labor is studied. The findings in Panel A reveal a significant long-run causality for total GDP and the volume of unskilled

Table 6. Granger causality tests when the total expatriate variable is considered

Table 6. Granger causality tests when the total expatriate variable is considered								
Variables	Short-Run causality (F-stats)		Direction of causality	Long-run causality (ECT t-stats)		Joint Short & Long-run Causality (F-stats)		Direction of causality
Panel A: GDP								
	$\Delta LGDP$					$\Delta LGDP \ \& \ ECT$	$\Delta LEXPAT \ \& \ ECT$	
	$\Delta LGDP$	-	-	-0.48*	-	-	11.45*	$EXPAT \rightarrow GDP$
	$\Delta LEXPAT$	0.73	-	-0.98***	2.89	-	-	
Panel B: HGDP								
	$\Delta LHGDP$					$\Delta LHGDP \ \& \ ECT$	$\Delta LEXPAT \ \& \ ECT$	
	$\Delta LHGDP$	-	-	-0.51**	-	-	8.19**	$EXPAT \rightarrow HGDP$
	$\Delta LEXPAT$	0.68	-	0.50	0.85	-	-	
Panel C: NHGDP								
	$\Delta LNHGDP$					$\Delta LNHGDP \ \& \ ECT$	$\Delta LEXPAT \ \& \ ECT$	
	$\Delta LNHGDP$	-	$EXPAT \rightarrow NHGDP$	0.15	-	-	3.56	
	$\Delta LEXPAT$	8.30*	$NHGDP \rightarrow EXPAT$	-0.57*	34.26*	-	-	$NHGDP \rightarrow EXPAT$

(*), (**), and (***) denote statistical significance at the 1%, 5%, and 10% levels respectively.

Table 7. Granger causality tests when the skilled expatriate variable is considered

Variables	Short-Run causality (F-stats)		Direction of causality	Long-run causality	Joint Short & Long-run Causality (F-stats)		Direction of causality
Panel A: GDP							
	$\Delta LGDP$	$\Delta EXPAT_SKILL$		(ECT t-stats)	$\Delta LGDP \ \& \ ECT$	$\Delta EXPAT_SKILL \ \& \ ECT$	$EXPAT_SKILL \rightarrow GDP$
$\Delta LGDP$	-	0.01	-	-0.44*	-	15.08*	
$\Delta EXPAT_SKILL$	0.34	-	-	-1.01	0.35	-	
Panel B: HGDP							
	$\Delta LHGDP$	$\Delta EXPAT_SKILL$		(ECT t-stats)	$\Delta LHGDP \ \& \ ECT$	$\Delta EXPAT_SKILL \ \& \ ECT$	-
$\Delta LHGDP$	-	0.25	-	-0.42	-	3.79	
$\Delta EXPAT_SKILL$	1.97	-	-	-1.71	2.93	-	
Panel C: NHGDP							
	$\Delta LNHGDP$	$\Delta EXPAT_SKILL$		(ECT t-stats)	$\Delta LNHGDP \ \& \ ECT$	$\Delta EXPAT_SKILL \ \& \ ECT$	
$\Delta LNHGDP$	-	9.58*	$EXPAT_SKILL \rightarrow NHGDP$	-0.14*	-	17.65*	$EXPAT_SKILL \rightarrow NHGDP$
$\Delta EXPAT_SKILL$	0.46	-	-	-0.08**	6.62**	-	$NHGDP \rightarrow EXPAT_SKILL$

(*), (**), and (****) denote statistical significance at the 1%, 5%, and 10% levels respectively.

(*), (**), and (***) denote statistical significance at the 1%, 5%, and 10% levels respectively.

Table 8. Granger causality tests when the unskilled expatriate variable is considered

Table 8. Granger causality tests when the unskilled expatriate variable is considered							
Variables	Short-Run causality (F-stats)		Direction of causality	Long-run causality	Joint Short & Long-run Causality (F-stats)		Direction of causality
Panel A: GDP							
	$\Delta LGDP$	$\Delta EXPAT_USKILL$		(ECT t-stats)	$\Delta LGDP$ & ECT	$\Delta EXPAT_USKILL$ & ECT	
$\Delta LGDP$	-	1.63	-	-0.46*	-	10.26*	$EXPAT_USKILL \rightarrow GDP$
$\Delta EXPAT_USKILL$	0.86	-	-	-0.75***	3.66	-	
Panel B: HGDGP							
	$\Delta LHGDGP$	$\Delta EXPAT_USKILL$		(ECT t-stats)	$\Delta LHGDGP$ & ECT	$\Delta EXPAT_USKILL$ & ECT	
$\Delta LHGDGP$	-	0.2	-	-0.49**	-	7.89**	$EXPAT_USKILL \rightarrow HGDGP$
$\Delta EXPAT_USKILL$	0.58	-	-	0.49	0.74	-	
Panel C: NHGDGP							
	$\Delta LNHGDGP$	$\Delta EXPAT_USKILL$		(ECT t-stats)	$\Delta LNHGDGP$ & ECT	$\Delta EXPAT_USKILL$ & ECT	
$\Delta LNHGDGP$	-	2.82***	$EXPAT_USKILL \rightarrow NHGDGP$	0.14	-	3.2	-
$\Delta EXPAT_USKILL$	7.86*	-	$NHGDGP \rightarrow EXPAT_USKILL$	-0.90*	36.55*	-	
(*), (**), and (***) denote statistical significance at the 1%, 5%, and 10% levels respectively.							

(*), (**), and (***) denote statistical significance at the 1%, 5%, and 10% levels respectively.

expatriate labor at 1% and 10% levels of significance, respectively. Considering the joint short and long-run causality tests, it is found that the volume of unskilled expatriate labor Granger causes total real GDP. Panel B indicates that long-run causality t-stats indicated significance in the error correction term for hydrocarbon GDP at the 5% level of significance. Furthermore, the volume of unskilled expatriate labor Granger causes real hydrocarbon GDP in the joint term. By examining Panel C, short-run test results show that the volume of unskilled expatriate labor Granger causes non-hydrocarbon GDP at a 10% level of significance. Further, non-hydrocarbon GDP Granger causes the volume of unskilled expatriate labor at the 1% level of significance. On the other hand, long-run causality for the volume of unskilled expatriate labor is significant at the 1% level of significance. In addition, non-hydrocarbon GDP Granger causes the volume of unskilled expatriate labor in the joint term.

In summary, the main results are:

- In the short term, the chicken-egg relationship is found between total expatriate and nonhydrocarbon GDP; and between unskilled expatriate and nonhydrocarbon GDP.
- Chicken-egg relationship is also found between skilled expatriates and nonhydrocarbon GDP, in the joint term.
- The number of expatriate labor has a Granger causality with GDP at some aggregated and disaggregated levels, in the long term.
- Skilled expatriates labor Granger causes nonhydrocarbon GDP, in all terms.
- Unskilled expatriates labor Granger causes hydrocarbon GDP, in all terms.
- Nonhydrocarbon GDP has a Granger causality with unskilled expatriate in the short and joint term and with total expatriates in the joint term.

7. Conclusion and policy implications

Despite the rapid economic growth experienced by the GCC countries, they continue to face a significant challenge with regard to unemployment among their nationals. It is therefore important to explore the link between foreign labor and economic growth in the short and long run, given the large inflow of foreign labor across the region. This research paper aims to investigate the relationship between economic growth and labor demand in Oman, focusing on skilled and unskilled labor as well as hydrocarbon and nonhydrocarbon GDP separately. Moreover, the study employs formal tests to ascertain the direction of short-term and long-term Granger causality among all variables, both at aggregated and disaggregated levels. A total of 18 Auto-Regressive Distributed Lag (ARDL) models are utilized to examine these relationships.

Results of the analysis indicate that foreign labor in Oman plays a significant role in economic growth, and not vice versa. Particularly, nonhydrocarbon sector growth could lead to a higher demand for foreign labor. It is found that foreign labor in Oman has a more remarkable linkage with the nonhydrocarbon sector than the hydrocarbon sector considering both skilled and unskilled expatriates. Moreover, relationships among studied variables are mostly negative in the short term due to adjustment to a new country and productivity reasons. These findings provide a guide to policymakers in Oman and the GCC countries on labor market correlations and dynamics so as to initiate effective labor market reforms and promote jobs for nationals.

Therefore, in a bid to tackle the ongoing issue of the GCC countries' growing reliance on foreign labor, the focus should be shifted to a few policies, such as developing a skilled workforce to address the shortage of skilled local labor; this could be attained by investment in quality education and training programs. Furthermore, another avenue to be explored concerns increasing the labor market participation of women, which would also contribute to promoting gender equality, given that women have traditionally been underrepresented in the workforce. Moreover, encouraging private sector growth would result in the creation of more job opportunities for locals; this could be achieved by reducing barriers to entry and providing incentives. Additionally, the implementation of labor market reforms, including the improvement of working conditions and

reduction of the sponsorship system, should aid in minimizing the reliance on foreign labor and simultaneously improving worker welfare. Finally, another policy would involve the promotion of entrepreneurship, leading to job creation, and hence, lesser dependence on expatriates. All of the aforementioned policies, if implemented, will support the aim of lowering the GCC countries' reliance on foreign labor, allowing them to overcome the social and economic challenges that arise with the presence of expats, and promoting sustainable economic development.

The limitation of this study is that the time horizon was limited to 17 years due to the lack of reliable and consistent data on the labor market in Oman. Labor data from 2020 onward were dropped for the validity of the measurement reasons. Moreover, accounting for factors like human capital and institutional capital would add more value to the quantification of the relationships and make it more informative.

This is a preliminary study considering the broad macro-level of the general relationship between foreign labor and economic growth due to the lack of studies on this controversial issue in the Arab Gulf countries. Several potential future studies could be conducted on the topic of economic performance and the demand for foreign labor in the GCC countries. For example, a comparative analysis of nationalization policies across different GCC countries could be conducted to understand the factors that lead to successful nationalization policies and identify potential best practices that could be adopted across the region; the impact of foreign labor on social and cultural factors; and the impact of economic policies on foreign labor demand and identify potential policy changes that could be made to better manage the demand for foreign labor. Future studies could also examine the substitutability between local and foreign labor under all skill levels, the influence of demographic changes on foreign labor demand, especially since the demographic changes in the region, including an aging population and declining birth rates, are expected to have a significant impact on the demand for foreign labor.

8. Availability of data and materials

The supporting data for this study can be obtained by making a request to the data owner, the Central Bank of Oman. The data is not publicly accessible due to privacy restrictions.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Authors' contributions

Conceptualization: I.A.; O.A.; and A.A.; Methodology: I.A. and O.A.; Formal Analysis: I.A. and O.A.; Investigation: I.A.; O.A.; Z.A.; and M.A.; Resources: O.A.; A.A. and S.A.; Writing—original draft: O.A. and S.A.; Writing—review and editing: I.A.; Z.A.; and M.A.

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Notes

1. The GCC (Gulf Cooperation Council) is comprised of Bahrain (BHR), Kuwait (KWT), Oman (OMN), Qatar (QAT), Saudi Arabia (SAU), and the United Arab Emirates (UAE).

2. Tables of these results are excluded to avoid redundancy and save space. They can be made available upon request from the corresponding author.

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Appendix

Table A1. Summary of results by model when the GDP-related variables are considered

Model #	Dependent Variable	Independent Variables	Timeline	Effect
Model 1	GDP	Total Expatriate Labor	short term	negative
			long term	positive
Model 2	HGDP	Total Expatriate Labor	short term	insignificant
			long term	insignificant
Model 3	NHGDP	Total Expatriate Labor,	short term	insignificant
			long term	positive
Model 4	GDP	Skilled Expatriate Labor	short term	negative
			long term	positive
Model 5	HGDP	Skilled Expatriate Labor	short term	insignificant
			long term	insignificant
Model 6	NHGDP	Skilled Expatriate Labor	short term	insignificant
			long term	positive
Model 7	GDP	Unskilled Expatriate Labor	short term	negative
			long term	positive
Model 8	HGDP	Unskilled Expatriate Labor	short term	insignificant
			long term	insignificant
Model 9	NHGDP	Unskilled Expatriate Labor	short term	insignificant
			long term	positive

Table B1. Summary of results by model when the expatriate-related variables are considered

Model #	Dependent Variable	Independent Variables	Timeline	Effect
Model 10	Total Expatriate Labor	Total GDP	short term	insignificant
			long term	insignificant
Model 11	Total Expatriate Labor	Hydrocarbon GDP	short term	insignificant
			long term	positive
Model 12	Total Expatriate Labor	Non-Hydrocarbon GDP	short term	insignificant
			long term	positive
Model 13	Skilled Expatriate Labor	Total GDP	short term	insignificant
			long term	insignificant
Model 14	Skilled Expatriate Labor	Hydrocarbon GDP	short term	insignificant
			long term	positive
Model 15	Skilled Expatriate Labor	Non-Hydrocarbon GDP	short term	insignificant
			long term	insignificant
Model 16	Unskilled Expatriate Labor	Total GDP	short term	insignificant
			long term	insignificant
Model 17	Unskilled Expatriate Labor	Hydrocarbon GDP	short term	insignificant
			long term	positive
Model 18	Unskilled Expatriate Labor	Non-Hydrocarbon GDP	short term	insignificant
			long term	positive